REMARKS

Claims 1-13 are pending in the application. Claim 1 is the only independent claim.

Claims Rejections - 35 U.S.C. § 103

Claims 1, 2, 4-6, and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,389,103 to Melzer et al. in view of U.S. Patent No. 2,581,564 to Villegas.

Claim 3 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,389,103 to Melzer et al. in view of U.S. Patent No. 2,581,564 to Villegas and further in view of U.S. Patent No. 5,908,428 to Scirica et al.

Claims 7-11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,389,103 to Melzer et al. in view of U.S. Patent No. 2,581,564 to Villegas and further in view of U.S. Patent No. 3,918,455 to Coplan.

Claim 12 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,389,103 to Melzer et al. in view of U.S. Patent No. 2,581,564 to Villegas and further in view of U.S. Patent Application Publication No. 2004/0260145 by Borst et al.

Applicant has amended claim 1 herein to provide a better definition of the invention. Applicant provides further observations and evidence herein to support his position as to the patentability of the claimed invention over the prior art and particularly over the art relied on by the Examiner in rejecting the pending claims.

Claim 1 As recited in amended claim 1, an atraumatic surgical needle has two tissue-penetrating needle tips and comprises a tubular metal shaft that is hollow from tip

to tip and that has a cylindrical external surface from tip to tip. The shaft has a central portion that is equipped with a hole through which emerges a surgical thread that is anchored inside the needle.

Applicant incorporates by reference the observations made in previously submitted Amendments as to the differences between the claimed invention and the prior art relied on by the Examiner. In addition, applicant tenders the following remarks and arguments.

According to the Examiner (Paragraph 8 of the Office Action), the needle of Melzer et al. can be "considered atraumatic to some degree".

Applicant respectfully points out that the present invention is not directed to a needle that is atraumatic to some degree but rather to an atraumatic surgical needle. Such a needle is defined by certain characteristics that are not present in the Melzer needle. The Melzer needle is not an atraumatic surgical needle.

In the medical and surgical field, an atraumatic needle is an "eyeless surgical needle with the suture permanently fastened into a hollow end" as set forth in the Biology-Online.org dictionary and in the On-line Medical Dictionary at cancerweb.ncl.ac.uk/omd. Clearly, the Melzer needle is not an atraumatic surgical needle.

In contrast to the atraumatic needle of the present invention, the needle of Melzer et al. does not have a hollow bore but rather has a cavity or dent that extends longitudinally and is open along its entire length. Thus, the Melzer needle does not have a tubular metal shaft.

In contrast to the atraumatic needle of applicant's present invention, the Melzer needle has an eye (36) with a suture thread being fastened at the eye.

The only feature that the Melzer needle has in common with applicant's needle is a two-tip structure. Even there, however, the similarity is merely superficial, both functionally and technically.

The two-tipped needle (4) of Melzer et al. is used as an integral part of a stitching machine for endoscopic suturing where the sutures are very different from those formed by use of applicant's atraumatic surgical needle. The needle of applicant's present invention is used as described in the specification and as illustrated in three (3) series of ten (10) drawings each, appended hereto as Exhibit A. The drawings show how the sutures, formed in plastic surgery, are made invisible by passing the needle back and forth, inserting the needle on later passes through the exit points of earlier passes.

The Melzer needle is designed for a completely different kind of surgery and could not possibly be used in the plastic surgery procedures for which applicant's atraumatic needle is designed. One of ordinary skill in the art would not consider the Melzer needle when designing an atraumatic needle for plastic surgery. One of ordinary skill in the art would not look upon Melzer et al. as offering anything useful for solving the problems addressed by applicant.

Even if one of ordinary skill in the art were to consider Melzer, the stitching apparatus and associated needle of that reference would offer no suggestion leading to the present invention because the Melzer needle is not an atraumatic needle, does not comprise a tubular metal shaft and has a traditional suture fastening system, namely, a traditional eye.

The Villegas reference discloses a needle that also has very little in common with applicant's needle. The only similarity is that the Villegas needle is indeed an atraumatic surgical needle. The Villegas needle is not a two-tip needle and does not have a central portion equipped with a hole for receiving a surgical thread. The Villegas needle has but one sharp tip, while a suture thread emerges from the other end, along the longitudinal axis of the needle.

Applicant's needle allows a surgeon to operate with a technique that would be impossible with any other needle. Applicant's present invention represents a great improvement over a prior two-tip needle invented by the applicant in 1984. That prior needle was solid and had an eye for fastening the suture thread and accordingly was not an atraumatic needle. Applicant's prior needle was disclosed in an Italian patent application, in the Italian magazine *Rivista Italiana di Chirurgia Plastica*, (Vol. 16, 1984)(copy appended as Exhibit B), and in the American journal *plastic and Reconstructive Surgery*, (79 No. 6, 1006-7, 1987). It took 18 years for applicant to invent the present dual tip needle and provide a truly atraumatic double tip needle even though the atraumatic needle has been known since 1774 and was probably invented in 1718. See the article from the *Annals of the Royal College of Surgeons of England*, Vol. 68, 1986 (copy attached as Exhibit C).

With respect to the Examiner's discussion in Paragraph 9 of the Office Action, applicant respectfully points out that in modifying the Melzer needle as related by the Examiner, one would arrive at a needle that does not accomplish the objects of Melzer et al. The needle as so modified would not be capable of performing the function of the

Melzer needle. In short, the Melzer invention would be destroyed. Accordingly, one of ordinary skill in the art would not be inclined to undertake such modifications.

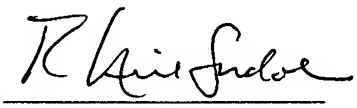
Conclusion

For the foregoing reasons, independent claim 1, as well as the claims dependent therefrom, is deemed to be in condition for allowance. An early Notice to that effect is earnestly solicited.

Should the Examiner believe that direct contact with applicant's attorney would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the number below.

Respectfully submitted,

COLEMAN SUDOL SAPONE, P.C.

By: 

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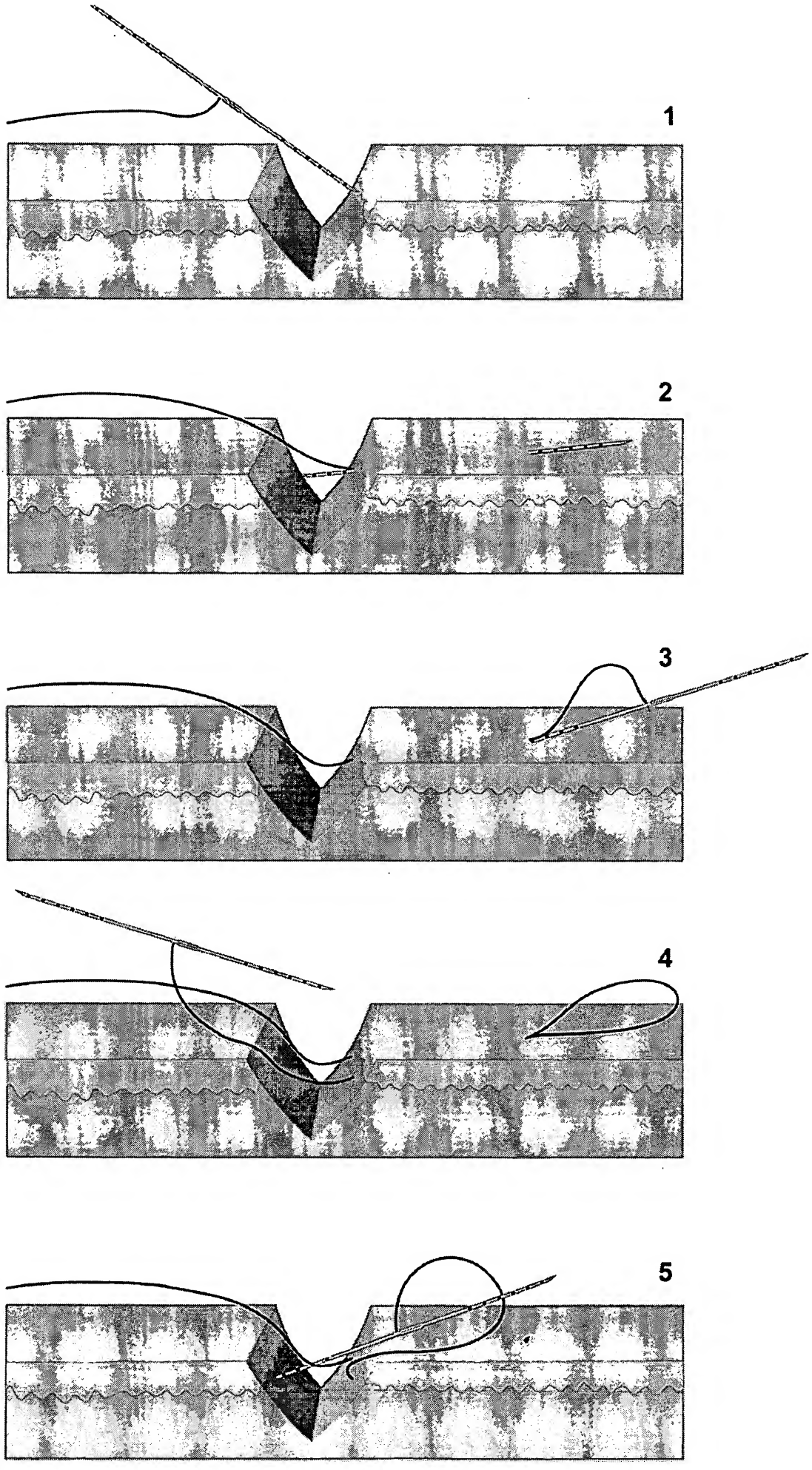
Dated: 26 November 2008

EXHIBIT A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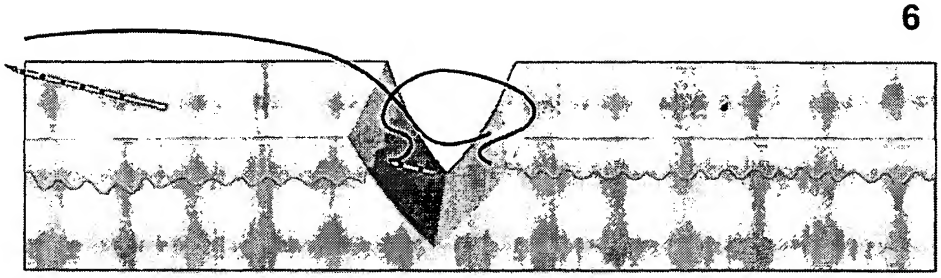

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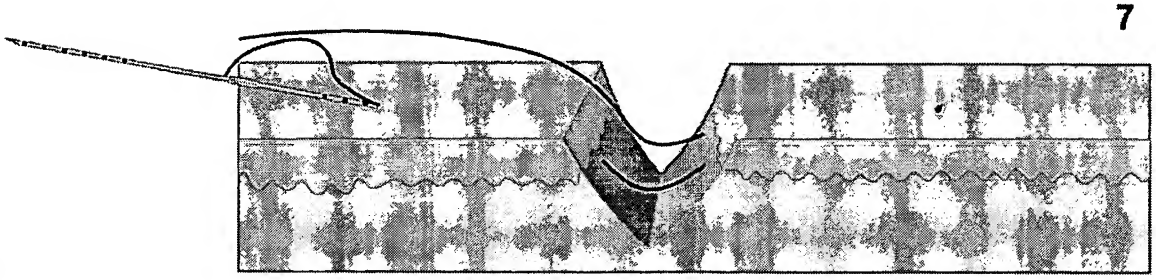

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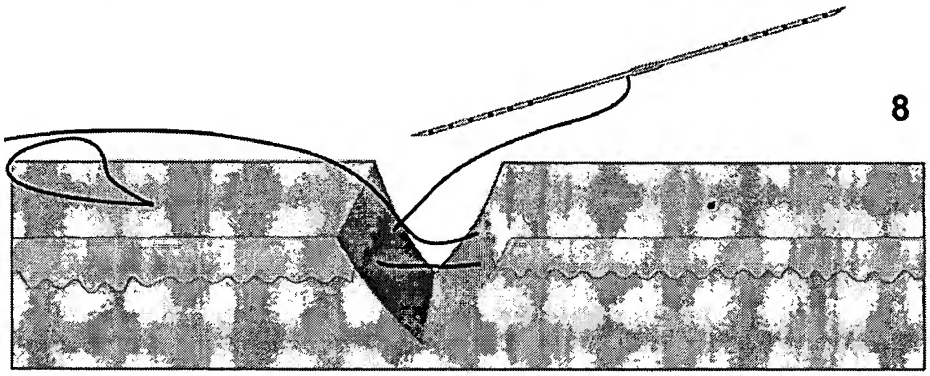

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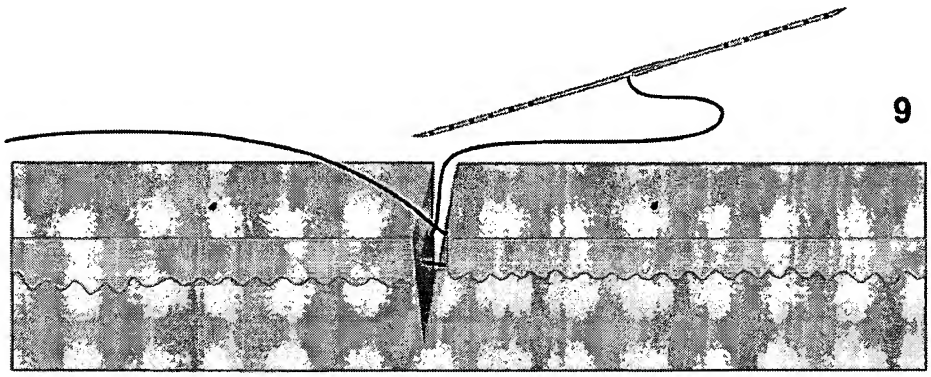

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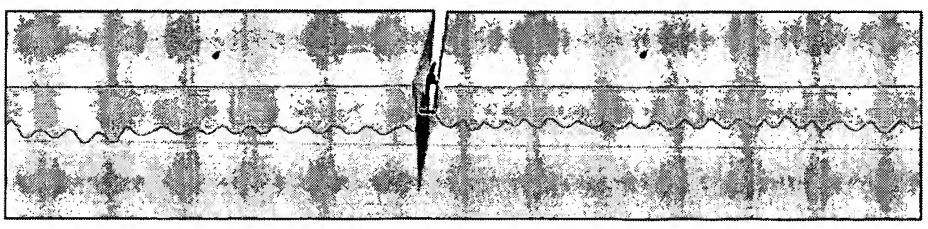

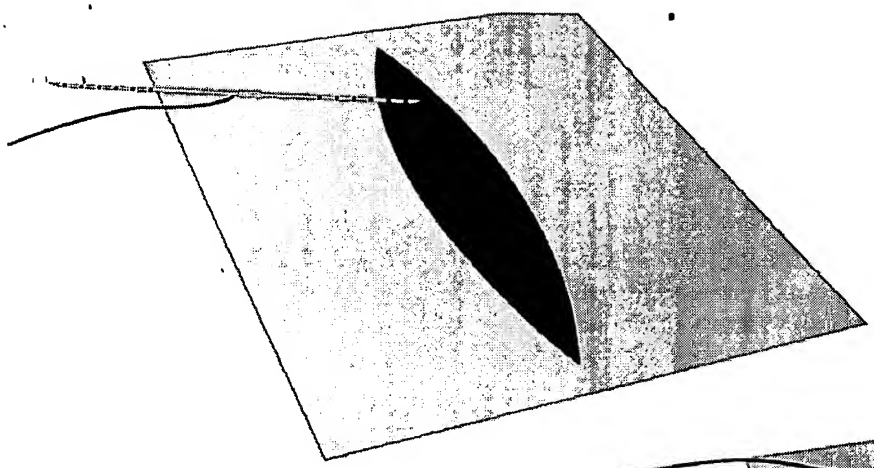

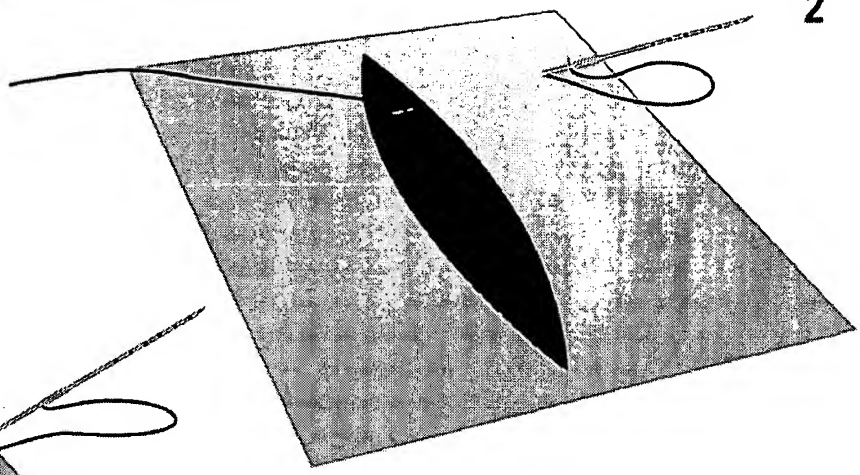
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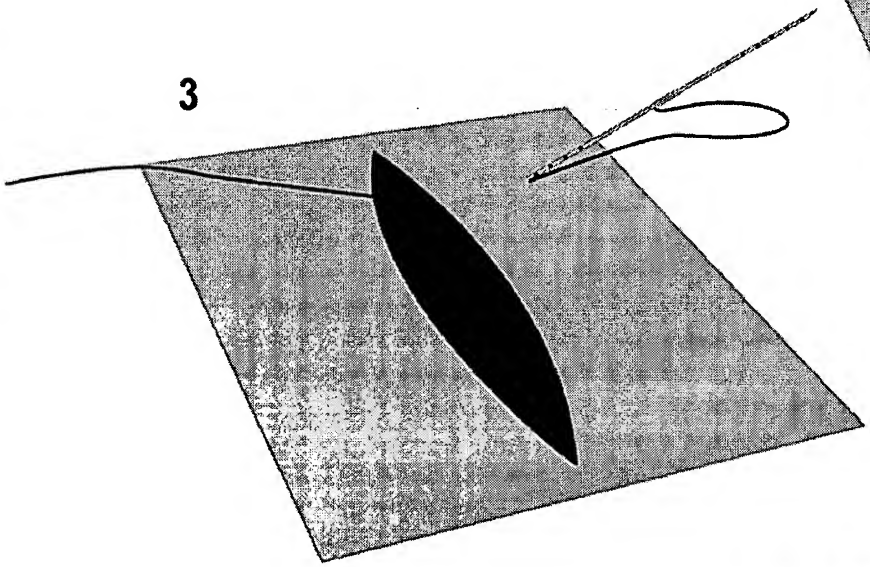
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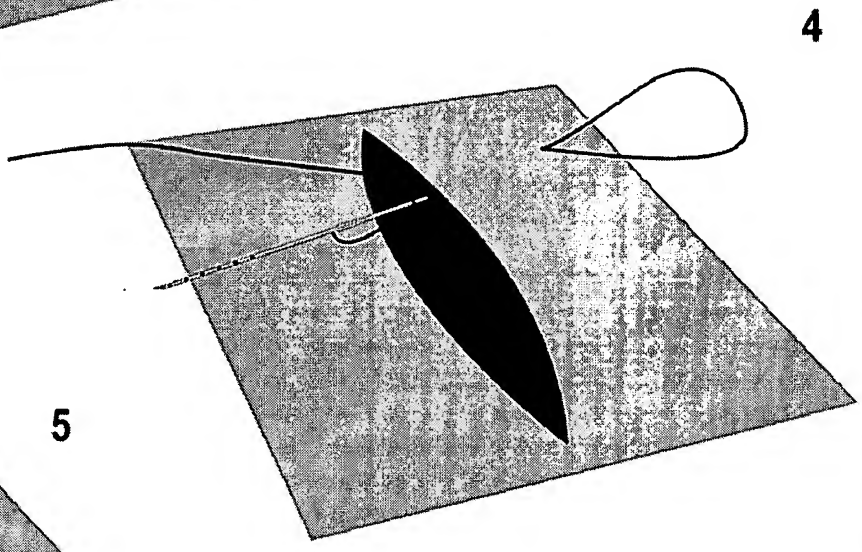
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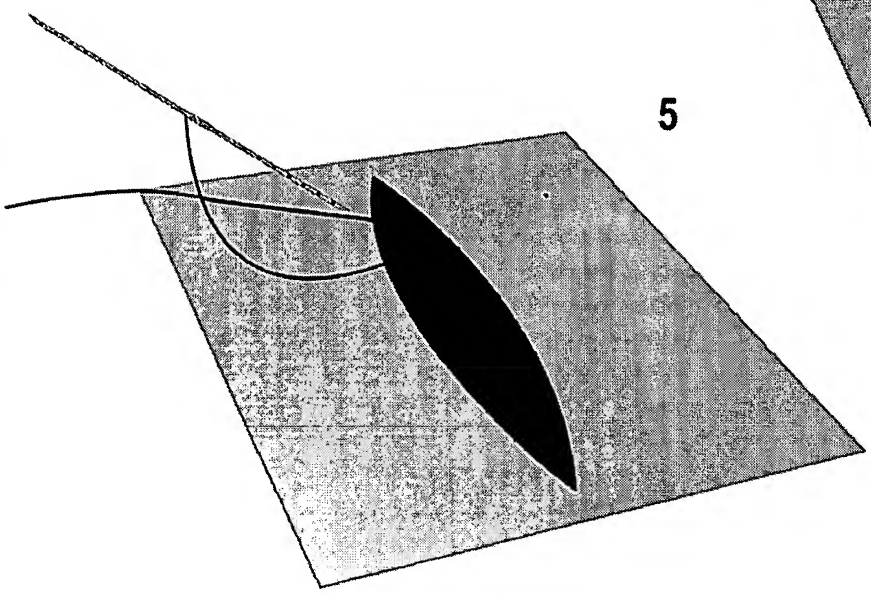
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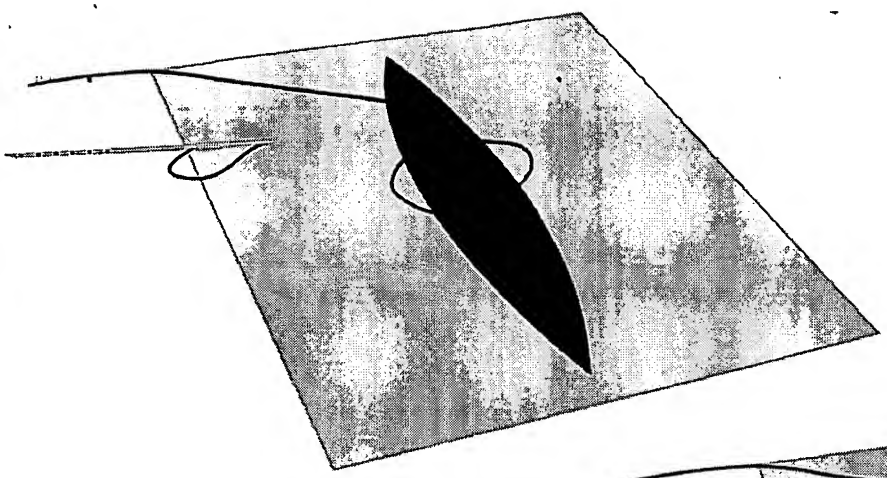

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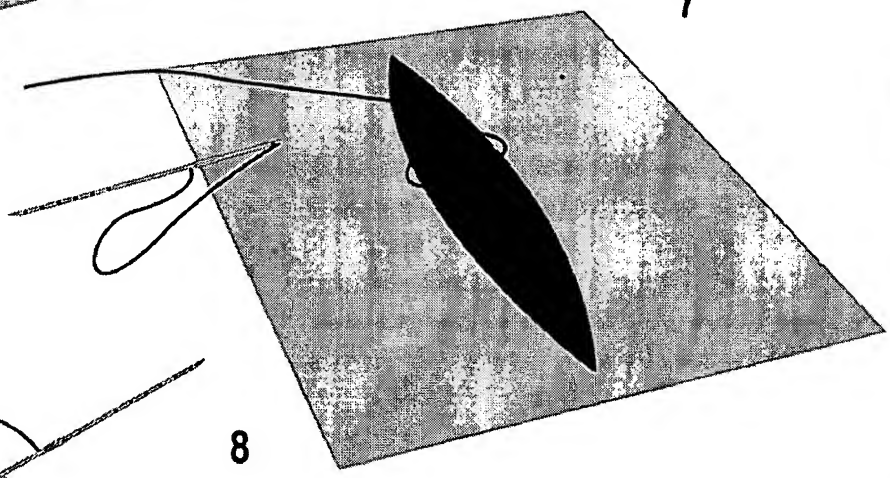

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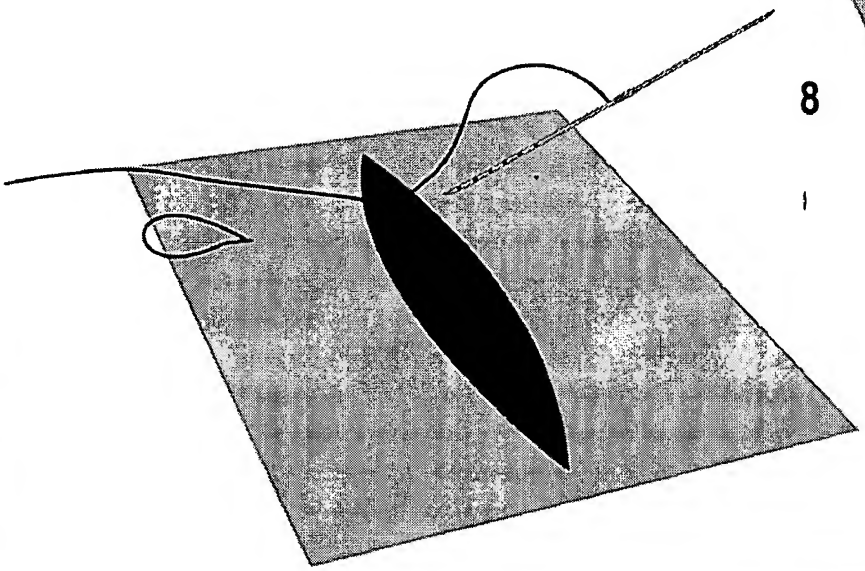

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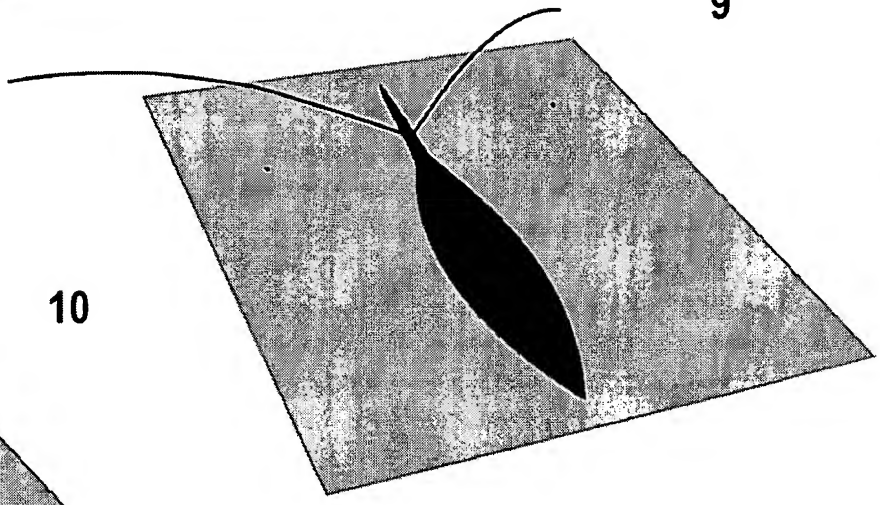

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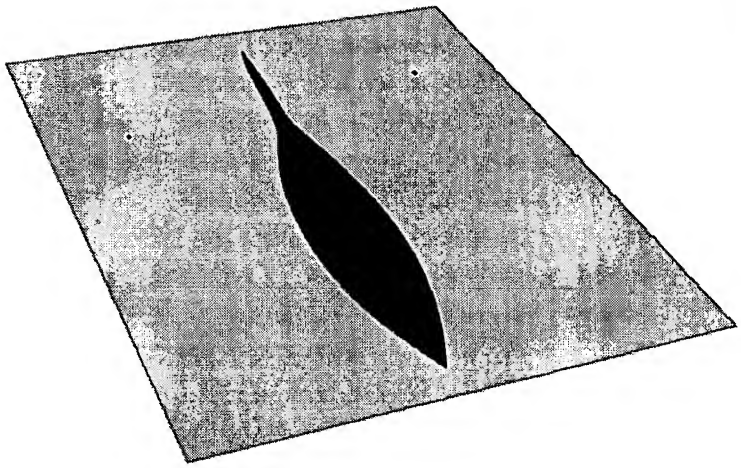

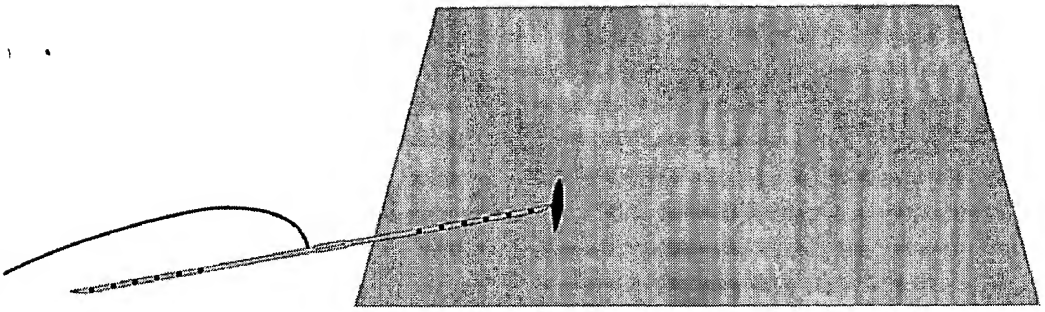

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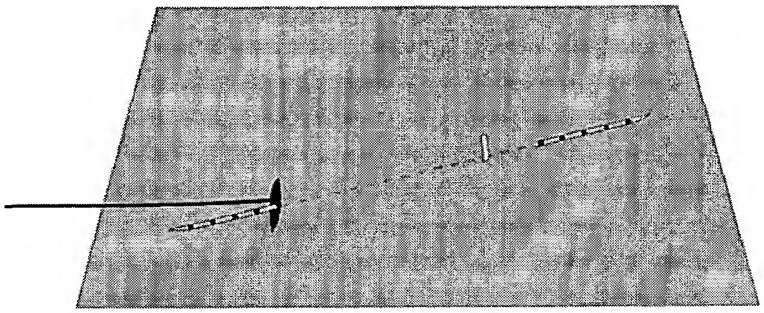

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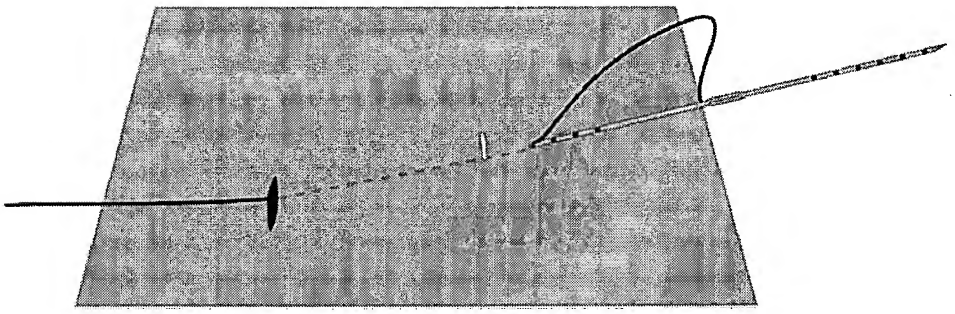

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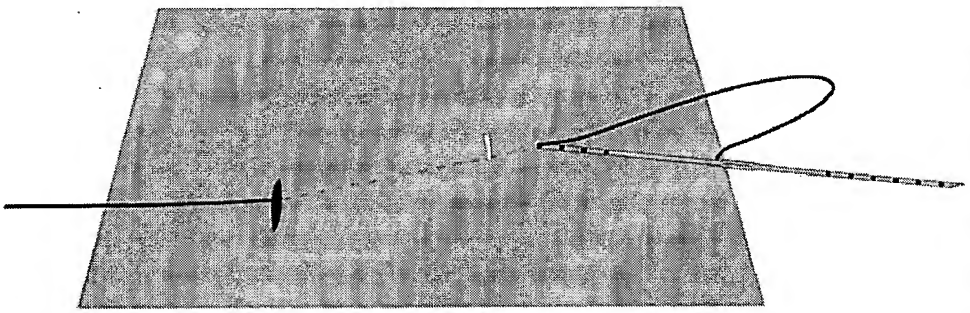

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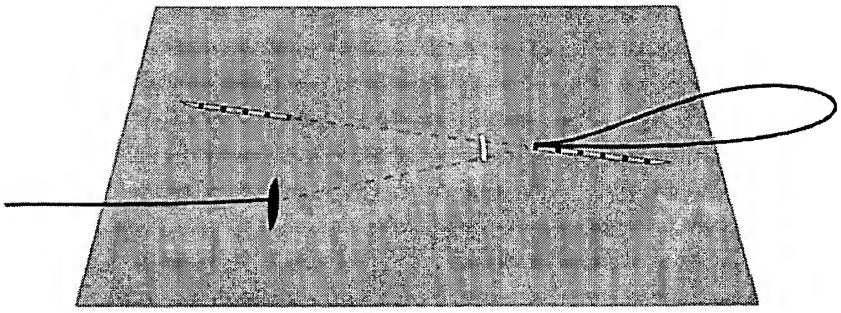

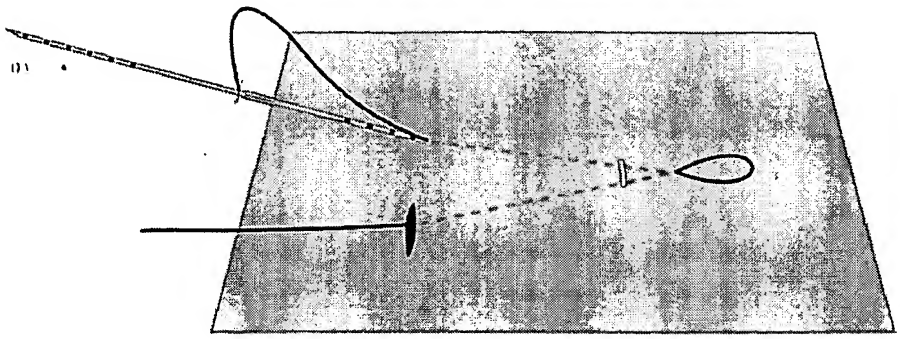

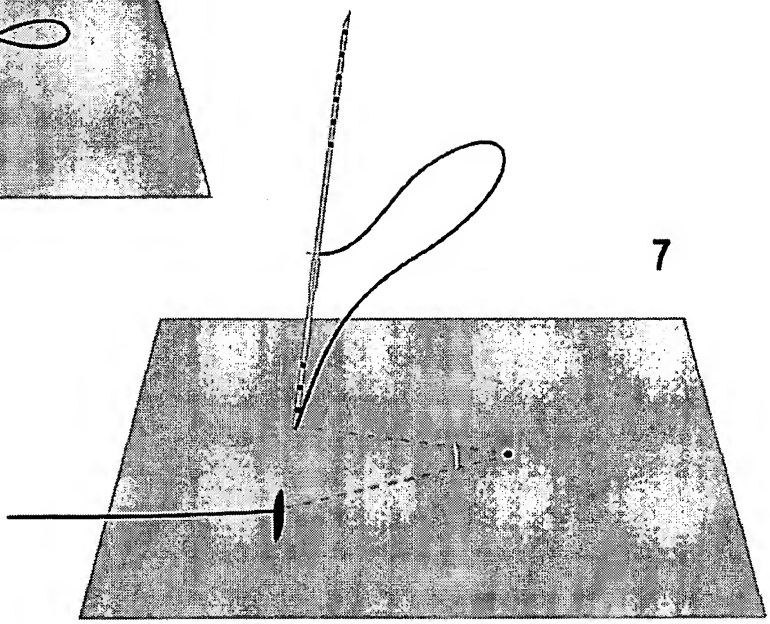
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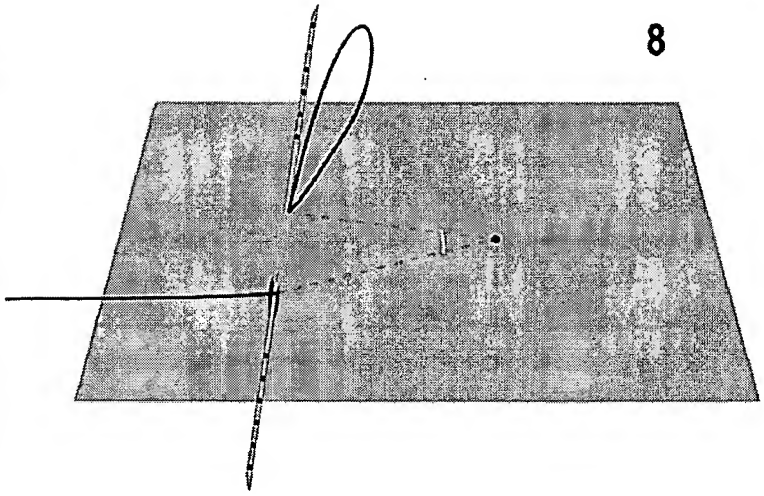
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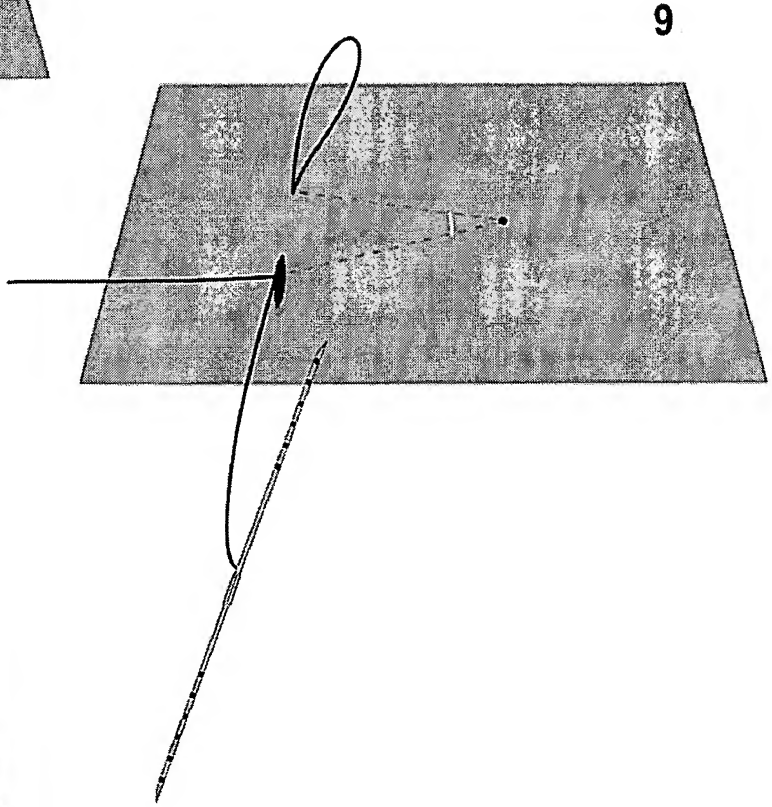
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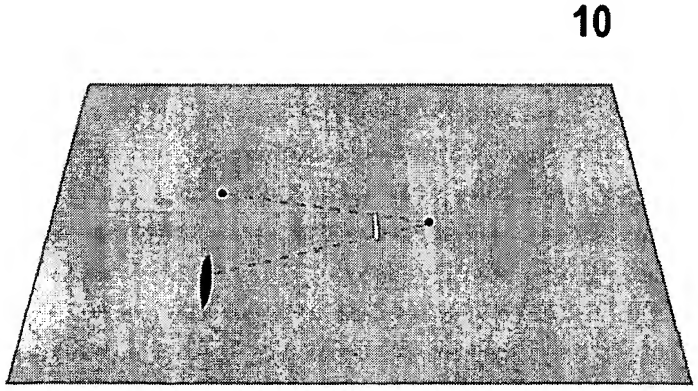
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EXHIBIT B

ESTRATTO DA:

RIVISTA ITALIANA

DI

CHIRURGIA PLASTICA

UN AGO A DUE PUNTE

S. CAPURRO Jr.

Ospedale S. Martino - Genova
Servizio di Chirurgia Plastica e Ustioni
(Primario: Prof. G. Boccasselli)

Atti del 33° Congresso Nazionale
della Società Italiana di Chirurgia Plastica
Palermo, 15/17 settembre 1983

Vol. 16 - 1984

UN AGO A DUE PUNTE

S. CAPURRO Jr.

Ospedale S. Martino - Genova
Servizio di Chirurgia Plastica e Ustioni
(Primario: Prof. G. Boeciarelli)

SUMMARY

A needle with two points.

A new surgical instrument has been realized which offers interesting prospects in reconstructive and aesthetic surgery: a needle with two points and central hole.

By means of this needle it is possible, by yust using the skin bend, to push into the subcutaneous tissue threads of any lenghts and on any directions without producing any scars.

By means of a cut of just 1 or 2 mm. it is therefore possible to make knots, geometrical figures and zig-zag under the skin in order to hang or modify the subcutaneous tissue.

This needle can be used to suture the nose septum as well.

Due to the hole fragility and to the necessary handling capacity, its use is limited.

È stato realizzato un nuovo strumento, un ago con due punte e cruna centrale o leggermente eccentrica (fig. 1), che offre curiose prospettive in chirurgia ricostruttiva ed estetica.

Con questo ago è possibile, ad esempio, utilizzando la semplice plicatura della cute, inserire nel tessuto sottocutaneo fili di qualsiasi lunghezza ed in qualunque direzione senza fare alcun taglio lungo il loro decorso (fig. 2).

È possibile inoltre, con un solo taglio di uno o due millimetri, eseguire sottocute nodi, figure geometriche, zig-zag, per sospendere o modificare il tessuto sottocutaneo.

L'ago a due punte può essere utilizzato anche per dare dei punti di sutura nel setto nasale cartilagineo.

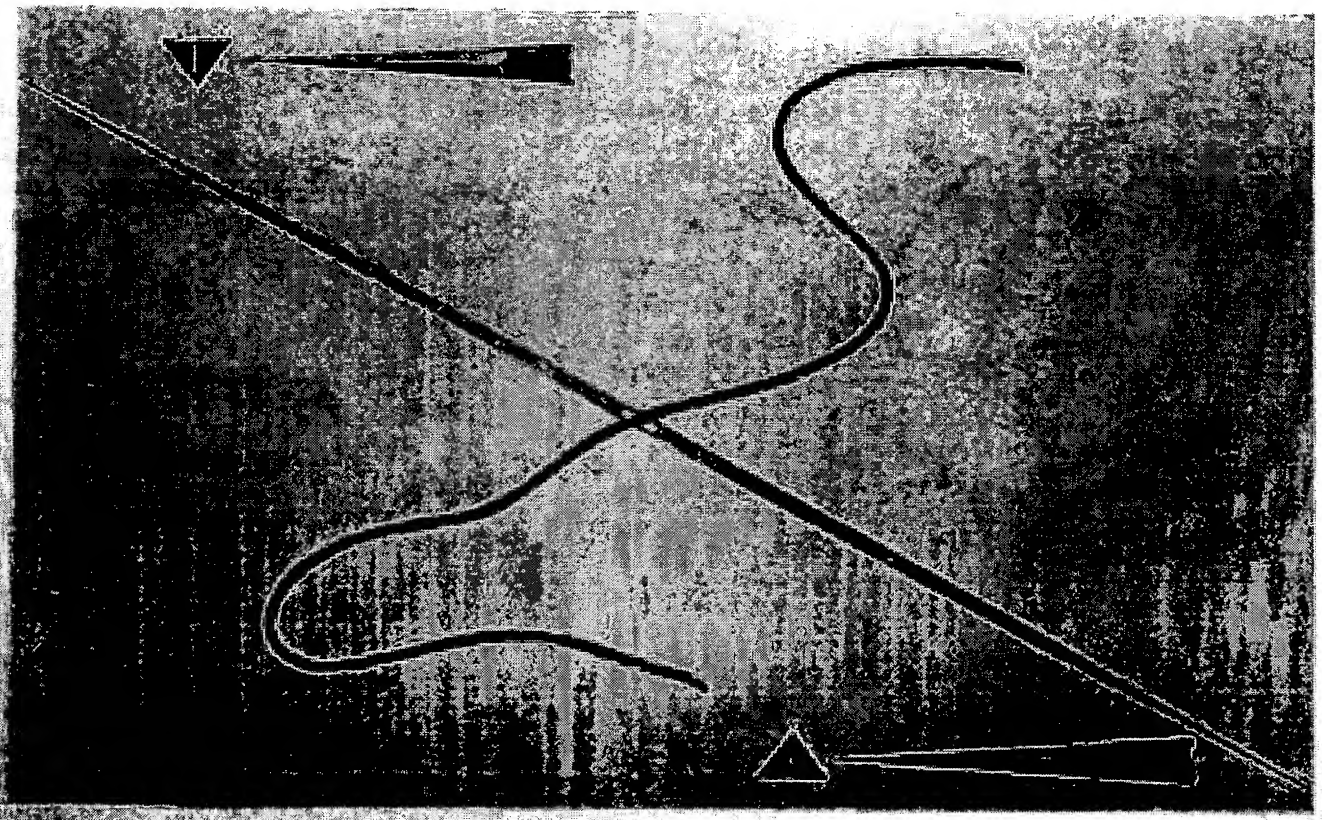

Fig. 1.

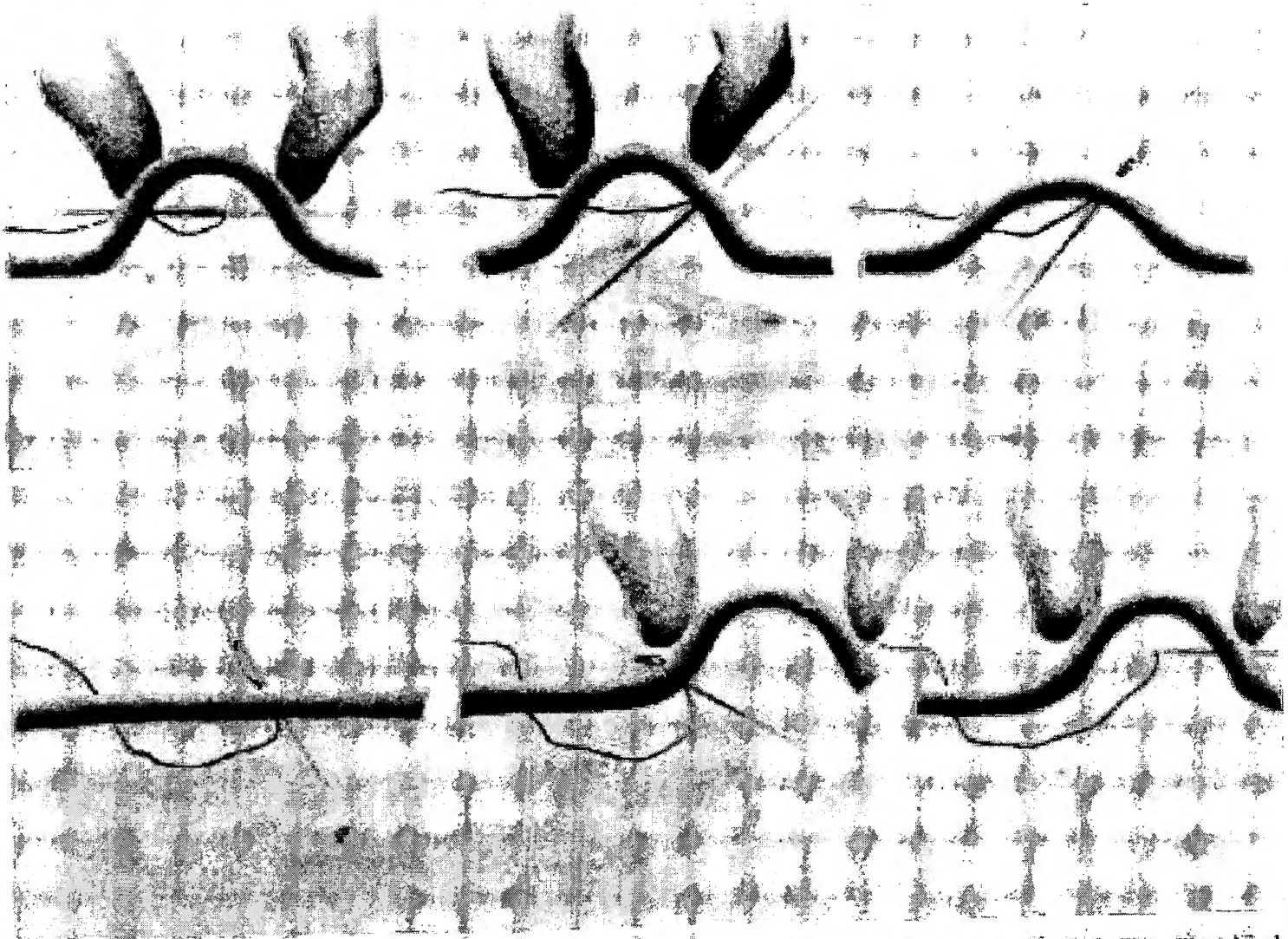

FIG. 1. Use of the double-armed needle. (Reprinted from S. Caparrò. Un ago a due punte. *Rio. Ital. Chir. Plast* 16: 1, 1984.)

I am confused about terminology. I had thought that autotransfusion referred to the aspiration and immediate filtration and reinfusion of shed blood at surgery. The term for storing a patient's own blood and reinfusing it by blood transfusion is more commonly referred to as autologous blood transfusion, in my experience.

Autologous blood transfusion is not without risk. Clerical error or contamination during handling of the blood is possible.

The risks of contracting AIDS through blood transfusion is exaggerated in the public mind. Blood Bank of Hawaii estimates the risk of contracting AIDS from a single-unit transfusion as three per million. The risk of fatal hepatitis from a single-unit transfusion is 30 times that.

Blood Bank of Hawaii charges $47 to $92 per unit for harvesting and storing autologous blood units. There is an additional hospital charge for the administration apparatus and a type and cross-match is required.

Dr. Mandel's assessment that patients "feel fine" and return to normal activities sooner if they receive autologous blood seems subjective. I had thought that modern blood transfusion utilization policies ruled out transfusion for subduction mammaplasty and autologous transfusion (*Plast. Reconstr. Surg.* 75: 339, 1985). He found that the need for transfusion was eliminated in patients having reduction mammaplasty if 1:200,000 epinephrine solutions were injected into the proposed incision areas prior to operation. I think that shaping the breast with the cutting electrocautery reduces blood loss as well.

Most of the patients undergoing reduction mammaplasty are good surgical risks and will tolerate a 1 to 1½ unit blood loss without change in vital signs or postoperative orthostatic hypertension. They tolerate and correct their surgical anemia quite well. The prophecy of a need for autologous blood can become self-fulfilling, since almost all patients come to the operating room with a lower red cell mass after donating 1 to 2 units of blood preoperatively. Dr. Mandel gives the figures 13.7 gm/dl hemoglobin concentration and hematocrit 39 percent as representative of his patients.

I quite agree with Dr. Mandel that patients undergoing multiple procedures such as those in his series having abdominoplasty combined with reduction mammaplasty might well require transfusion and are excellent candidates for autologous blood. For patients I consider at risk for likely transfusion at elective surgery I strongly recommend that they

EXHIBIT C

Annals of the Royal College of Surgeons of England (1986) *vol.* 68

The history and evolution of surgical instruments. V Needles and their penetrating derivatives

JOHN KIRKUP FRCS
Consultant Orthopaedic Surgeon, Bath Clinical Area
Assistant Honorary Curator, Historic Instrument Collection, Royal College of Surgeons of England

> "Have a nedle three cornerid . . . and the lippis of the wound schal be sowid togideris." Lanfranc translated, 14th century *(1)*.

Despite modest, even diminutive dimensions, suture needles induce small operative wounds, being therefore related to knives, razors and scalpels which typically generate wounds longer than the width of their blades. By contrast, suture needles and allied needling or penetrating derivatives cause wounds rarely greater in length than the instrument's maximum diameter, and hence include pins, nails, handled needles, cataract needles, myringotomes, tenototomes, trocars, awls and drills whose penetrating power depends on the surgeon's actions of pushing, rotating and hammering (Table V).

TABLE V *Penetration by needles and related instruments*

ACTIONS	INSTRUMENTS
Pushing	
(a) Shoulder movement predominating	Straight needle
	Hare-lip pin
	Trocar
	Tenotome
(b) Wrist movement predominating	Curved needle
	Handled cleft-palate and hernia needles
	Myringotome
Rotating	
(a) Pronation and supination alternating	Bone awl
	Bone reamer
	Steinmann pin
	Kirschner wire
(b) Continuous supination	Bullet screw
	Uterine myoma screw
	Spanton's hernia needle
	Bone twist drill
Hammering	Bone nail
	Bone staple

Until the antiseptic revolution in surgery, suture needles were substantial, hand-held instruments functioning as intimate extensions of the surgeon's fingers and diligently preserved in his instrument case. Today they are unloved, insignificant and often miniscule requiring at least a needle-holder, if not a microscope, to manipulate them by remote control for a single application before ignominious consignment to the incinerator.

As suggested in Table II *(2)* of this series, the modification of pointing the extremity of a basic metal rod is one of six fundamental instrument fabrications which also includes folding to form a hook and canalisation to form a tube. Hence, whilst sharp retraction hooks, artery tenacula and hollow needles are pointed, they are excluded from discussion here, as their particular function is closer to that of the hook and tube respectively.

Needles

NEEDLE MANUFACTURE

It is probable that the earliest manufacture of needles in bronze, iron and steel involved the forging of individual metal fragments, perhaps as early as 4000 BC when copper smelting began, though their application to surgical procedures is unlikely before 600 BC. Later, needle making became a specialised craft; Hayward records that in the 14th century, Cistercian monks at Bordesley Abbey, near Redditch in Worcestershire converted drawn steel wire into eyed needles *(3)* by stages which are still the basis of manufacture (Fig. 33). About 1655, needle manufacturers were sufficiently independent to establish a Guild of Needle-makers in Threadneedle Street, London although Redditch became the principal centre of manufacture in Britain and indeed remains so. Before Lister made surgery of the body cavities safe, suture needles were principally employed for skin closure and their variety and range was small. Indeed there were no wholly surgical needle manufacturers and surgeons requested a glover's straight, a sail-maker's curved or an appropriate needle made for another craft *(3)*. Druitt wrote in 1859 ". . . the straight glover's needle is very convenient, and may be procured at any cutlers," *(4)*.

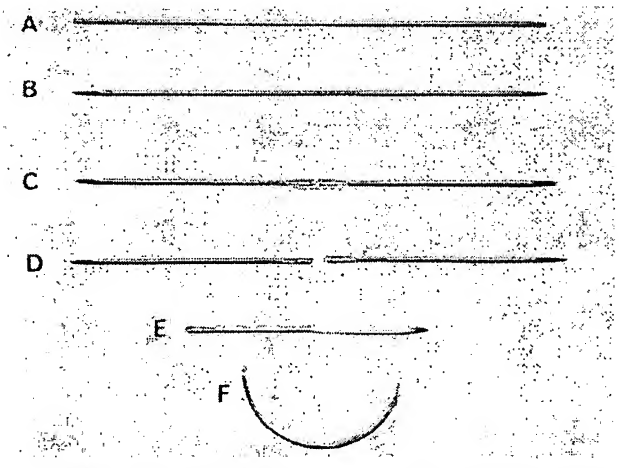

FIG. 33 Manufacture of cutting needle. A, Wire straightened and cut to length; B, Ends pointed; C, Eyes stamped and pierced; D, Needles separated and surplus material removed; E, Shank flattened, blades formed and sharpened; F, Bent to shape and then tempered, polished and finished. (Courtesy of Needle Industries Ltd, Redditch.)

However, following the introduction of aseptic methods, the demand for surgical needles of increasing sophistication escalated and, in Britain, certain firms found it economic to concentrate their effort in this new field. By 1961, diversities of size, shape, point and eye enabled Shrimpton and Fletcher to offer approximately five thousand different needles for purchase *(5)*.

THORNS AND PINS

From the Old Stone Age, thorns, sharpened wood, bone splinters and ivory points have been used in gimlet fashion to pierce animal skins for the passage of thongs or thread in the manufacture of clothing *(6)*; whether these items were applied to human wound suture, and when, is uncertain but thorn closure is recently recorded in Africa (Fig 34). The transverse skewer method of Kenya is very similar to the hare-lip or figure-of-eight suture employing metal pins (Fig. 35) and approved by Albucasis in the 10th century *(7)*. As late as 1936, instrument catalogues still advertised hare-lip pins up to four inches in length *(8)*. Acupressure pins, briefly popularised in the 19th century for vessel occlusion *(9)*, are of similar construction.

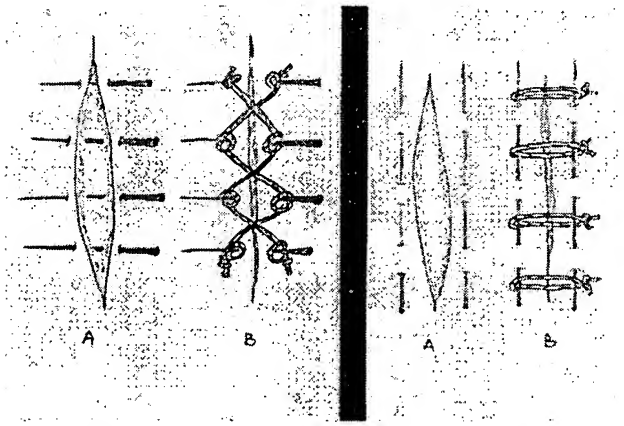

FIG. 34 Wound closure with thorns and fibre. (i) Drawn after specimen from Kenya presented to the Wellcome Institute for the History of Medicine in 1936. (ii) Drawn after description of method witnessed by L Hayward in the former Belgian Congo.

EYED NEEDLES

Eyed ivory and bone needles capable of conveying thread material have been found in late Old Stone Age deposits *(10)* although it is unlikely they were ever employed to close wounds, for their bulk around the eye would have precluded easy penetration of the skin. Thus it is likely the first practical surgical needles were made of copper or bronze, probably with round bodies and non-cutting points. Hippocrates makes no certain reference to skin suture but does recommend that bandages were secured by stitching the ends with a needle and thread *(11)*. However, it is claimed the ancient Indian text of Shushruta described triangular pointed and curved needles in 800 BC *(12)*, although considerable uncertainty surrounds this date, for the earliest known manuscript copy was not compiled till the 5th century AD *(13,14)*.

It is unfortunate that needles are easily mislaid and readily disintegrate when made of iron or steel, thus rarely surviving intact before the 18th century, obliging us to search illustrated manuscripts and printed books to authenticate their structure. Even so, interpretation may be difficult as Fig. 36 (i) demonstrates. In 1497, Brunschwig shows in Fig. 3 *(15)* both lance and round-pointed needles whilst in 1575, Paré illustrates three-cornered or trocar pointed straight and curved needles without evidence of a grooved eye to reduce the bulk caused by thread (Fig. 36 (ii)). However, the text of De Mondeville, before 1320, advised excavating the needle

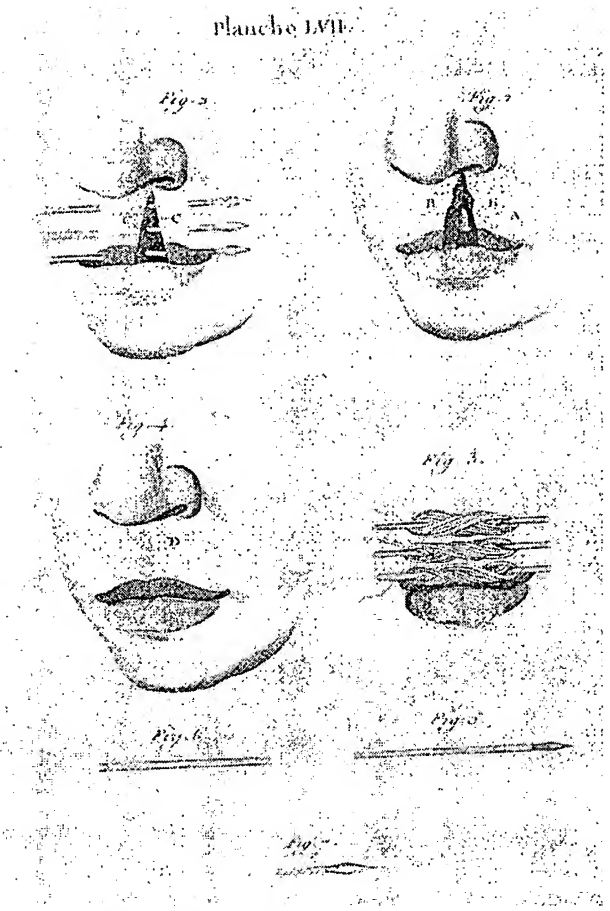

FIG. 35 Hare-lip and the figure-of-eight suture. 1, The defect; 2, Margins of defect trimmed and three hare-lip pins introduced; 3, Figure-of-eight suture around pins; 4, After healing; 5, 6, 7, Blunt pin hollowed at one end to receive needle-pointed introducer. (From: Bell B. Cours Complet de Chirurgie, 1796.)

close to the eye to accommodate thread *(16)* and Salicet, in 1275, noted the superior power of the triangular over the round point *(17)*. De Mondeville also remarked that to suture wounds inside the mouth or of the eyelids, a curved needle was best. When this, the crooked needle, curved in its distal half (the half-curved needle) first appeared is uncertain but the full half-circle like the five-eighths needle are late 19th century innovations. In addition to variations of shape, length, diameter and point, considerable ingenuity and skill was applied in manufacturing a diverse range of eyes (Fig. 37, A–H), often offered as alternative choices; for example, the spring eye proved popular in France but enlisted little support in Britain. Today the significance of the eye has all but disappeared as surgeons and health services have embraced the disposable eyeless needle.

EYELESS NEEDLES

Despite recent claims, the eyeless concept has origin at least in 1718 when Heister noted ear-piercing being performed with a needle hollowed proximally to convey a blunt sleeper and commented on Petit's larding needle, split proximally to carry hare-lip pins *(18)*. In 1774, Petit's posthumous book illustrated these needles (Fig. 38) and in the plate description stated, "Engage the suturing thread in the slot which acts like a pincer," yet curiously failed to enlarge on this eyeless threading in his text *(19)*. Clearly this idea did not develop and was forgotten.

In 1859, Druitt illustrated Murray's needle with a proximal groove communicating with an open tube end for wire

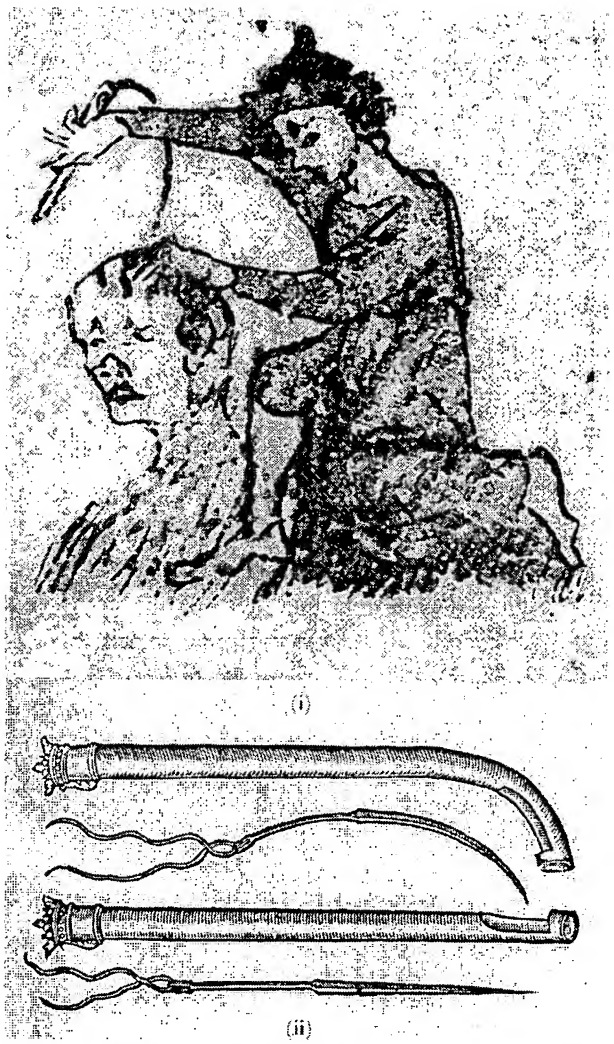

FIG. 36 (i) Needle suture of scalp in an early 14th century manuscript. (Reproduced from: Jones PM. Medieval Medical Miniatures, 1984, with permission.) (ii) Three-cornered cutting straight and crooked needles without grooved eyes; the two suturing cannulae were held in the opposite hand to apply counter-pressure during needle penetration. (From: Paré A. Three and Fifty Instruments of Chirurgery, 1631.)

sutures *(20)* (Fig. 37,H). In 1874, an atraumatic needle drilled out proximally for catgut thread and wire was patented by Mrs E Gaillard of San Francisco for leather workers under the name "Eureka" needle *(21)*, although contemporary testimonials indicate that surgeons also used and approved them for wound suturing in the same year. Despite this, the surgical application failed to prosper. Meanwhile in 1891, two superintendents of the Birmingham School for the Blind in England patented a similar eyeless needle to evercome the difficulties of the sightless in threading eyed needles *(22)*, without engaging surgical interest.

In 1913, Souttar a surgeon in London, introduced a short silver ferrule to grip thread whilst clinched onto an eyeless needle to overcome the difficulties of the sightless in thread-unreliable. After limited success, it was superceded by the more economic integral flanged head patented by Ovington of Massachusetts in 1921 and developed by Davis and Geck *(21)*, and by Shrimpton and Fletcher *(22)*. Today we are back to a drilled out head and have accepted disposability. Nevertheless, the adoption of the atraumatic needle in Britain has been only gradual, as resistance to the conservation ethic has crumbled on many fronts.

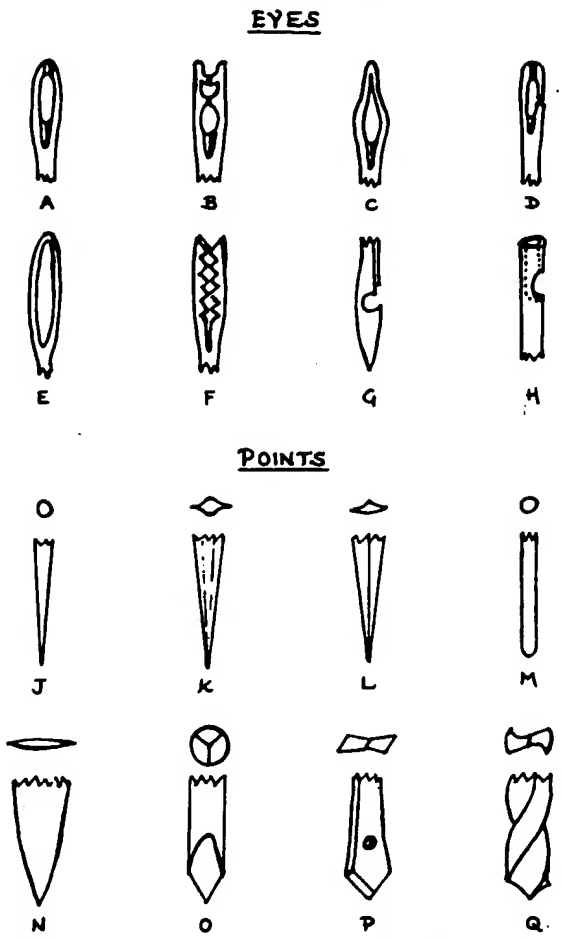

FIG. 37 Eyes and Points. A, Standard grooved eye; B, Spring of split eye; C, Benjamin's or Paterson's thread gripping eye; D, Lister's or side-threading eye; E, Lane's or loop eye for fascia; F, Digby's crocodile jawed eye for fascia; G, Reverdin's distal opening and closing slot eye; H, Murray's tube-eye for wire; J, Round-bodied point; K, Cutting spear point; L, Cutting triangular point; M, Blunt point; N, Lance point; O, Trocar point; P, Awl point; Q, Twist drill point.

HANDLED NEEDLES

It is necessary to distinguish between hand-held needles (proximal eye) and handled needles (distal eye) (Fig. 39) although both are concerned with suturing techniques. Probably descended fom the gimlet of leather workers, the handled needle receives no mention by ancient authors until Paré figured a crooked needle in 1564, with a distal eye to convey gold or lead wire for hernia repair *(23)*. Subsequently the suture carrying hernia needle became an important instrument and a model for naevus, cleft palate, vaginal fistula and episiotomy handled needles, as well as the blunt aneurysm ligature needle (Fig. 39). However, the golden era of the handled needle came when Reverdin (1842–1908) introduced the slot eye, and later a closing slot controlled by a lever on its handle (Fig. 37G), conceived for pedicle ligature and for rapid wound closure methods still in use, especially in France.

Penetrating derivatives

These derivatives are handled, rarely have eyes and are not concerned with suturing despite the appellation needle, as for exampie, the acupuncture needle of ancient Far Eastern lineage, the couching needle, the exploring needle, the dissecting needle and so on. In general the surgical penetrat-

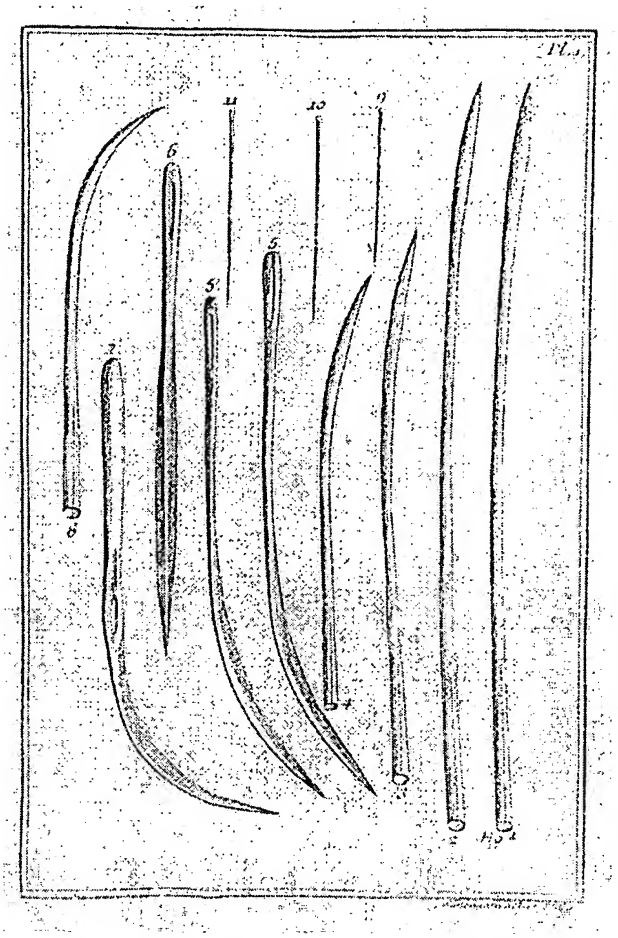

FIG. 38 A selection of needles. 1, 2, 3, 4, 8, Larding needles, hollow and split proximally to engage hare-lip pins or clinch thread for eyeless suture; 5, half-curved cutting needles with grooved eyes; 6, Straight cutting needle with grooved eye; 7, Half-curved cutting needle with central eye for vessel ligature; 9, 10, 11, Hare-lip pins. (From Petit JL. Traité des Maladies Chirurgicales, 1774.)

ing items can be classified according to the nature of their distal point.

SPEAR, LANCE AND KNIFE POINTS

The bleeding lancet with its symmetrical double-edged blade (Fig. 37, N and Fig. 40) is first illustrated in works of the 16th century, being applied in stabbing fashion to puncture fluid collections and abscesses for diagnosis and therapy as well as venepuncture. The phlebotome mentioned by Hippocrates for bleeding and for draining empyemata either resembled a spear point or the triangular fleam, the antecedent of the lancet in Rennaisance Europe. The exploring needle of Albucasis is also of uncertain structure *(24)* but in the 19th century exploring needles either had a V-shaped section or an acutely angled trocar-point with an integral fine cannula. The myringotome, developed in the 19th century for puncturing the ear drum, is distinctly spear-pointed and possibly adapted from the cataract needle.

The couching or cataract needle for lens dislocation is noted by Shushruta, Celsus and Paulus; the latter wrote, "and turning round the point of the perforator, which is bent at its extremity, we push it strongly through . . ." *(25)*. Albucasis described the same procedure illustrated by brass spear-shaped blades on a handle *(26)*. Couching needles such as Cheselden's in the 18th century and Hey's and Bowman's in the 19th century were extremely finely spear-pointed whilst Scarpa's resembled a tiny curved scalpel.

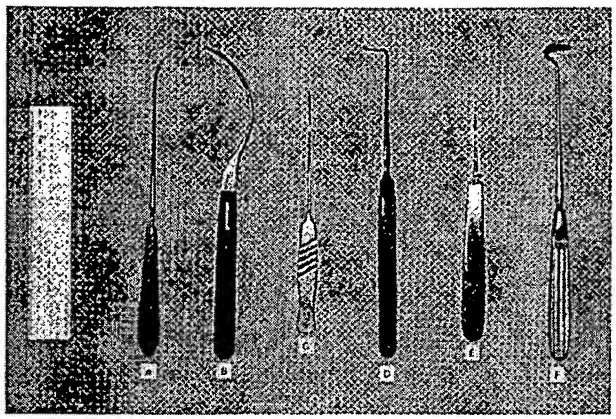

FIG. 39 Handled needles with distal eyes. A, Naevus, Cooper's; B, Hernia, Wood's; C, Suture, Elder's; D, Fistula, Durham's; E, Suture Reverdin's opening and closing slot eye; F, Hernia, Macewen's blunt.

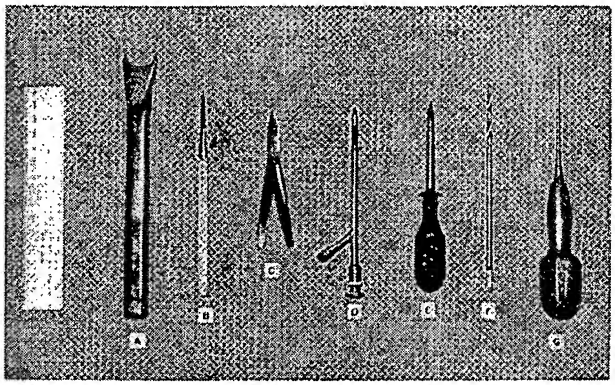

FIG. 40 Penetrating derivatives. A, Staple starter; B, Cataract knife; C, Bleeding lancet; D, Gall-bladder trocar and cannula, Ochsner's; E, Paracentesis trocar and cannula; F, Bone twist-drill; G, Bone awl.

The cataract knife and the tenotome developed in the 19th century also have sharp-pointed narrow scalpel blades, needle-like in their application through conjunctiva and skin (Fig. 40).

TROCAR AND AWL POINTS

Albucasis described an exploring needle with four sides which Spink and Lewis suggest is the earliest known example of a trocar despite an unsatisfactory accompanying illustration *(27)*. By definition trocar means three-sided from the French 'trois-quarts' and the earliest example of this perforator with three cutting edges is obscure. As late as 1707, Dionis offered his students the ancient method of paracentesis employing lancet, sound and cannula in succession or the modern method with combined trocar and cannula, stating the latter was more humane and efficient. Sadly his woodblock of the trocar is poorly detailed *(28)*. However in 1719, Heister engraved with clarity two trocars and their matching silver cannulae *(29)*, close to present designs (Fig. 40), whose three cutting edges separated by three faces produce characteristic tri-radiate wounds of the skin (Fig. 37, O). Other trocar pointed instruments include the antral drill, Spencer-Wells' ovariotomy trocar, Southey's anasarca trocar, Ochsner's gall-bladder trocar, Kidd's bladder trocar, drainage tube introducers and so on (Fig. 40).

The bone awl point is distinguished from the trocar by its two faces and five cutting edges and often an eye near the point (Fig. 37, P). Based on the awl of cobblers and carpenters, this instrument is applied by hand (Fig. 40) although in the early days of the internal fixation of

fractures, awl points were driven by brace and were advertised as bone drills *(30)*. Other items with awl points include Lambotte's bone screws, Hey Grove's transfixion pins and some examples of Steinmann's pin and Kirschner's wire.

SCREW-THREAD POINTS

Celsus described two types of bone drill, the artisan's or unguarded terebra and the guarded terebra, both driven by a thong or bow. The former was used to remove portions of diseased skull by drilling a series of holes and linking them by chisel. Paulus added, "If a weapon be lodged deep in bone of considerable thickness it may be bored out with drills" *(31)*. Although it is assumed such drills were screw-threaded, the thread section was probably short and resembled the tire-fond of bullet extractors and bone sequestrum screws of the 16th century shown in Fig. 5 *(15)*. The guarded drill or terebra abaptista was specifically designed for safe skull penetration; Galen commented, "It is best to have several for every thickness of the calvarium; for the thicker bone longer are required, for the thinner bone shorter" *(32)*.

As already indicated, the application of the twist drill of engineering to bone surgery was preceded by awl pointed drills which were not displaced generally till the 1930's.

Further examples of screw-like action include cork-screws for extracting uterine myomata and fractured femoral heads, and Spanton's screw for approximating the walls of the inguinal canal in herniorraphy.

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Book Review

Standard Orthopaedic Operations by John Crawford Adams. 463 pages, illustrated. 3rd Edition 1985. Churchill Livingstone, Edinburgh. £32.

Crawford Adams' Textbook on Operative Surgery was a guide and trusted companion to many of us during our own orthopaedic training. It might therefore seem churlish to be critical but I am afraid that I cannot recommend this book to the present generation of trainees. A revolution has occurred in operative orthopaedic practice since this book was first produced in 1969, a time when hip replacement was not yet universal and the Swiss AO system was represented in the UK by a solitary practitioner. Not even the eloquence of the author's pen, nor in places his strenuous attempts to update the book, can overcome the abiding impression that one is visiting a small orthopaedic museum. That most diabolical of orthopaedic instruments, the circular saw still consumes a page of text as avidly as it used to consumed assistant's fingers! On the other hand the proper use of orthopaedic cement does not even appear under basic orthopaedic technique. Plasters still run from toe to groin and the AO system is noteable only by its absence. There is little on arthroscopy and nothing on arthroscopic surgery. To be fair the sliding hip screw gets an adequate mention but the outmoded and weak Jewitt nail plate still has equal recommendation. Even the total hip is represented by the large head, banana stemmed, McKee-Arden prosthesis.

This book was an excellent testament to the skill and practices of the previous generation. It was a sad decision to try to prolong its life into a third edition.

F W HEATLEY